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THE MANAGEMENT OF INDIA'S WILD LIFE SANCTUARIES AND NATIONAL PARKS

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(With four plates)

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INTRODUCTION

The gradual extermination of wild life in India has now reached a stage when it is of the utmost importance that the exact status of wild life sanctuaries should be reviewed, and the feasibility of creating national parks considered. The administration of these sanctuaries, formerly 'game reserves', has up-to-date been entirely in the hands of the Forest Department, under whose jurisdiction they naturally fall.

Here it should be stressed that a strong, independent and separate department, adequately officered by men of sound training and a natural aptitude for the work in hand, is the best means of ensuring the really successful organization and administration of India's wild life sanctuaries and national parks. The possibility of some State, perhaps Bombay, succeeding in creating and financing a separate Wild Life Department should not altogether be ruled out.

But while it would be eminently desirable to form a separate and independent 'Wild Life Department' to control the management of all sanctuaries containing valuable wild life, shortage of funds and personnel as well as other considerations may render it necessary that, for the present at any rate, the State Forest Departments should continue to administer these sanctuaries. Strengthened by supplementary staff to perform the extra supervisory duties entailed by the preservation of wild life, and with the necessary directives from the Central and State Governments, it should not be impossible for the State Forest Departments to perform effectively the task of wild life conservation in addition to their other work. By this system the problems of dual control are eliminated, and the difficulties of a separate Wild Life Department working alongside the Forest Department with inevitable duplications will not arise.

It is sometimes difficult, however, to reconcile the functions of the Forest Department, which might seek to exploit the timber and other revenue-producing resources of the forests, with measures dictated by the necessity of preserving intact places of great faunal and scenic value. With this difficulty in view, a step forward has recently been made by the proposal to create Wild Life Advisory Committees to advise State Governments on measures to be adopted for the preservation and control of wild life, and for the creation of national parks.

A start has already been made at the Centre by the constitution of a Central Board for Wild Life, presumably to advise the Central and State Governments, to coordinate measures and to collect information and the like. Each State in turn will, it is hoped, form its own committee to advise the State Government, as at the Centre. As these committees will consist of non-officials as well as officials, the personnel would be properly representative of the people of the country and its best interests.

It is to be hoped that each important State of the Indian Union will be able to create the post of 'Wild Life Warden' or 'Wild Life Officer'. This person should be of a status not lower than that of a Divisional Forest Officer, and not under any D.F.O. but responsible to the head of the Government Department himself. It would be an advantage if he resided at the main sanctuary or national park of the State, and not at the city headquarters of the Government.

There is some uncertainty in certain circles as to whether the utilization of forest and other resources is permissible within a sanctuary or national park. It will soon be the duty of Wild Life Advisory Committees in India to make decisions on this point, and to advise their Governments on all matters pertaining to sanctuaries and national parks. With the object of resolving doubts, avoiding controversies and making the decisions of Advisory Committees easier, it is necessary to examine carefully the different aspects of sanctuary and park management and

their possible good or bad effects on wild life in relation to the country's interests. Measures for the preservation of wild life in general and matters relating to finance are beyond the scope of this paper, and have therefore not been dealt with.

The exploitable resources of India's existing or potential national parks include timber, fuel, thatch, building posts, cane, grazing and fodder; mineral resources; water for hydro-electric schemes; catching of wild animals such as elephant and rhinoceros; and fishing. There are in India two viewpoints on this question: one is that the sanctuaries and national parks should be entirely sacrosanct, and that no form of exploitation or interference would be justifiable under any circumstances. And the other viewpoint is that this source of revenue should be tapped and the bulk of it utilized for the upkeep of the park concerned.

An analysis of the experiences of other countries in this matter would not be out of place here, and might even be of some assistance to us in India in the conservation of our rich and varied wild life and in the management of the places in which it is found.

National Parks in other Countries

(1) Britain. Owing to the comparative absence of wild animal life in Britain, the national parks of that country take on a mainly scenic character. They are usually 'areas of outstanding natural beauty'. Perhaps the best general definition of Britain's national parks is that given by John Dower: 'An extensive area of beautiful and relatively wild country in which, for the nation's benefit and by appropriate national decision and action, (*a*) the characteristic landscape beauty is strictly preserved, (*b*) access and facilities for public open-air enjoyment are amply provided, (*c*) wild life and buildings and places of architectural and historic interest are suitably protected, while (*d*) established farming use is effectively maintained.' Established farming, in other words agricultural exploitation, is actively encouraged, because much of the beauty of rustic Britain is actually due to the handiwork of farmers and others.

The machinery devised by the National Parks Commission under the 1949 Act ensures that in national parks and other chosen areas 'the defacement of the countryside can be prevented unless there are overriding reasons to the contrary. Such reasons, before being accepted, will have to be given the closest consideration by all concerned.' Very few of the areas proposed as national parks in Britain hold valuable timber forests. In Britain national parks are proposed by the National Parks Commission, constituted under the Act of 1949, and proposals are laid before Parliament. An actual national park is planned and controlled by the County Council of the county in which it lies; but a proportion of the members of local planning authorities are nominated by the Minister of Town and Country Planning, to ensure that wider and national interests are not overlooked. Grants of money are made from the national exchequer for national park development. The fifth national park, on the Pembrokeshire coast of Wales, was established in March 1952.

In 1949 the Nature Conservancy was set up by Royal Charter, and the first nature reserve under its jurisdiction was established in

November 1951—an area of 10,450 acres at Beinn Eighe in Scotland. Nature reserves were clearly defined by the London Convention for the Protection of African Fauna and Flora of 1933, and are areas of natural history interest placed under public control but closed to all forms of human activity except by special permission.

In addition, 'The National Trust for Places of Historic Interest or Natural Beauty' has existed since 1907, and owns and preserves a great number of places of exceptional interest and beauty for the enjoyment of the people.

(2) U. S. America. In the U.S.A., a very much larger country, the national parks are vastly more extensive and on a much grander scale. They are mainly 'primeval' and scenic in character, and are created by Acts of Congress. They are usually 'Areas of national significance distinguished by superlative natural scenery, set aside for preservation as nearly as possible in unimpaired condition and dedicated to the use and inspiration of the people.'

With regard to commercial exploitation, the National Park System advocates 'Protection of resources that are now being used for their highest purpose—the inspiration and enjoyment of the American people—against any commercial exploitation that cannot be justified on the basis of need so pressing that the economic stability of the country, or its existence, would be endangered unless such use were permitted.' When there was an effort in the U.S.A. to legislate for the reduction of the 1000 square mile Olympic National Park so that the forest resources could be tapped, Secretary Krug declared: 'I am convinced that such forest as that which gives Olympic National Park such outstanding distinction must be preserved, if future generations of America are to have the privilege of savouring fully and deeply its wilderness grandeur.

Many of America's national parks contain timber forests, and these are 'kept in their natural condition as far as possible'. Treatment of forest stands is under the supervision of expert foresters. There are many great waterfalls, but they are not used for power, as there are more than enough waterfalls outside the parks to supply the power needs of the country. Wild life is carefully controlled, and the numbers of hoofed animals kept within the limits of the available grazing, surplus animals being destroyed or removed where necessary.

These national parks are managed in a way that 'developments in the parks and monuments shall be limited to those needed to accommodate the public and to permit visitors to obtain the fullest measure of enjoyment of those features that give distinction to the areas. A corollary is that these developments shall intrude as little as possible upon the natural scene, particularly if it be one of the extraordinary quality'. Efforts are being made to reduce the existing grazing covered by permits, and to eliminate the private holdings within the National Park System. In all cases, the ultimate interests of the people of the whole country are taken into account, and this is illustrated by the measures taken to reduce the area of the 1289 square mile Joshua Tree Monument. In this park a third of the area was to be relinquished, in order 'to consolidate and retain the lands important for their rare desert flora, scenic and geological interest; and to delete lands in

which mineral values are believed to outweigh those for which they were originally included in the monument'. This reduction in size was to have the effect both of simplifying administration by releasing for mining lands better suited for that use, and of preserving inviolate the sanctity of the monument against outside exploitation.

National parks in the U.S.A. are entirely national in character, being managed not by States but by the National Park Service, which is part of the Department of the Interior of the Federal Government. They are financed entirely by the Federal Government.

The United States Fish and Wildlife Service was established in June 1940 by consolidation of the former Bureau of Biological Survey and the Bureau of Fisheries, both of which agencies were transferred at that time to the Department of the Interior. It is charged with the enforcement of all federal laws concerning wild life, provides technical advice and conducts research and so on.

The Forest Service is responsible for the management of all national forest resources including wild life. Through its Division of Wild Life Management, it co-operates closely with Federal and State agencies in the enforcement of game laws and in the development of suitable wild life habitats.

(3) Africa. In the Union of South Africa and in East and Central Africa the national parks are mainly faunal. The most famous of these is the 8000 square mile Kruger National Park of the north-eastern Transvaal. This is under the National Park Board of Trustees of South Africa, and is probably the best known show-place for wild life in the world.

In Kenya the objects of the Royal National Parks have been admirably expressed by the Trustees in their recent report: 'National parks have been established in Kenya in the nature of a National Trust, under authority of an ordinance, for the preservation of wild animal life, wild vegetation, and objects of aesthetic, geological, prehistoric, archaeological, historical or other scientific interest. We recognise that as Trustees we have two main duties. The first duty is clearly to preserve and safeguard all objects within a national park, whether animate or inanimate, and as far as possible, to ensure that the places forming this trust will remain unimpaired for the benefit of future generations. Our second main duty is to develop our national parks for the interest, advantage and enjoyment of the general public. These two tasks are frequently in conflict, for the preservation of any area would be greatly simplified by excluding all visitors from it, and we have continually to find a satisfactory balance between the two. In this endeavour our decisions must naturally be influenced more by the requirements of the future than by the immediate and often unjustified demands of one generation.'

As in the case of the U.S.A., the national parks of Africa are usually vast in size. With the exception of the Serengeti National Park of Tanganyika they do not contain much exploitable timber forest or other resources; in fact the Tsavo National Park was 'what remained after every conceivable interest in Kenya had the opportunity of rejecting it'. And even now the possibility of prospecting and tapping the mineral resources of this park has not been

entirely ruled out under the terms of the National Parks Ordinance. In the event of valuable minerals being found, it is possible that 'the economic claims for the production of minerals would probably prevail' over the claims of game preservation, though the answer might be found in an alteration of the boundaries of the park. The extensive area of this 8000 square mile national park would easily permit of this.

With regard to the recently created Mt. Kenya and Aberdare National Parks, it appears that certain powers relating to forest management, water resources and fish conservation have been reserved for the Forest Department. It will be interesting in later years to see how this system of dual control works out in these mountain national parks, and whether the national park system in Kenya can succeed in withstanding 'the changing demands of economic development, and the changing policies of Government Departments'.

(4) Ceylon. Of all Asian countries Ceylon is probably the foremost in the field of wild life conservation. Her Game and Fauna Protection Society has for many years been doing in an unofficial capacity very largely what is visualized as the functions of the proposed State Advisory Committees in India.

In Ceylon the various categories of wild life sanctuaries are clearly distinguished. National reserves are divided into three kinds: (*a*) strict natural reserves, e.g. Yala (149 square miles), Wasgomuwa (112 square miles) and others; (*b*) national parks, e.g. Yala (60 square miles), Rohuna (53 square miles) and Wilpattu (212 square miles); and (*c*) intermediate zones, e.g. Wilpattu South (27 square miles), Yala East (69 square miles) and others. Entry on permit is allowed into the national parks and intermediate zones: shooting on permit is allowed, under strict control, in the intermediate zones. In addition to these national reserves there are a number of conservation areas, or sanctuaries, mainly for the preservation of birds.

National Parks in India

Though there are a great many sanctuaries in India for the preservation of wild life, and many more reserved forests in which shooting of game is controlled by law (officially, at least), the concept of national parks is still in its infancy. Nonetheless there is in India a clear distinction between a wild life sanctuary and a national park. Sanctuaries are formed by State Forest Departments and proclaimed as such in Gazette Notifications, and can therefore be altered or abolished in a similar manner; though in actual practice substantial changes are not usually made in sanctuaries without the sanction of the Ministers concerned. National parks, on the other hand, are created by Acts of the State Legislatures, and therefore possess the same degree of permanency as in other countries.

Here it should be mentioned that under the new Constitution of the Indian Union all powers regarding legislation for the protection of wild animals and birds are vested in the State Governments. The Centre will only encourage, advise, assist, co-ordinate and so on.

(1) Uttar Pradesh. The chief national park in India in existence at present is the Hailey National Park of Uttar Pradesh,

A scene in the Hailey National Park, Uttar Pradesh.

F. W. Champion

Cheetal. Hailey National Park, U.P.

Annual burning off of elephant grass. Kaziranga Wild Life Sanctuary, Assam.

E. P. Gee

A view of the Bhutan Hills. North Kamrup Wild Life Sanctuary, Assam.

which was created by the U.P. National Parks Act in 1935, an area of 125 square miles. This park is administered by the Uttar Pradesh Chief Conservator of Forests under Article 6 (1) of the Act; and though open to visitors is not much visited by the Indian public or by tourists from abroad. Timber is extracted from it by the Forest Department according to a working plan, by which mature trees of certain species in particular blocks are felled in rotation. The revenue from this exploitation amounts to Rs. 5 or 6 lakhs per annum.

In actual practice, therefore, the Hailey National Park is not much more than a very fine reserved forest permanently closed to shooting. The formation of a Wild Life Advisory Committee in U.P. would be an impetus to the Forest Department in the management of the place as a successful and popular national park. It seems obvious that the decision as to which parts should be exploited for timber, and which portions should be left untouched as 'preservation plots' or unspoiled for their scenic and faunal interest, should not rest entirely with the Forest Department, but should be decided only after joint consultation with naturalists, scientists and understanding members of the public.

It is improbable that the State of Uttar Pradesh would be willing to relinquish the revenue from this park; and if a too strict adherence to the principle of 'no exploitation' were to be insisted on, the park would cease to be. A compromise, therefore, seems to be the only solution. Either it should be possible to revise the Act, and to set aside a smaller area of the greatest faunal and scenic value, and this could be the new inviolate Hailey National Park in which there could be no exploitation. The remainder of the area could then remain entirely closed to shooting; and could continue to be worked by the Forest Department, without much (if any) loss of revenue to the State. Or else a clearly defined 'permanent' Forest Working Plan could be inserted into the Act, restricted in order to give more prominence to national park interests without loss of revenue. The primary object of the park would then be to the preservation of the fauna and flora and the improvement of the scenic and other amenities for visitors; and the secondary object the restricted utilization of timber resources. Thus the park could continue undiminished in size, with the 'preservation plots' legally fixed and sanctified for all time.

At present these preservation plots are each of only one square mile in extent; and it would obviously be preferable from the wild life point of view to allot larger areas of five, ten or even twenty square miles as selected areas of natural vegetation in which the associated fauna could thrive undisturbed. An example of such an area is the 'inner sanctuary' of 22 square miles in the 310 square mile Venugopal Wild Life Park of Mysore State.

(2) B o m b a y. In Bombay State some creditable progress has been made by the passing of the Bombay National Parks Act 1950. But the newly formed Kanheri National Park of only 9 square miles is lacking in fine scenery and wild life. With its caves and carvings and close proximity to the city of Bombay, it has the character rather of a people's park and a public monument. With afforestation and the reintroduction of wild life which formerly existed there, it should in future years possess attractions of a wider appeal.

A wild life sanctuary in the forests of North Kanara at Dandeli has been established by the Bombay Government, and there were proposals to make this 80 square mile area into a national park. A recent report, however, indicates that the area is greatly disturbed due to continuous work, that wild life has become very scarce in that district, and that after all the area may not be suitable for making into a national park.

(3) Mysore. Although Mysore State possesses no national parks, yet the Venugopal Wild Life Park of 310 square miles is a potential one. Normal forest operations are allowed in the area, but a significant factor in the management of this park is the maintenance of an inner sanctuary or 'sanctum sanctorum' of 22 square miles, which is completely sacrosanct. As a safe refuge for all species of wild life, and as an area of natural and undisturbed vegetation, this inner sanctuary should satisfy the demands of both naturalists and scientists.

This park adjoins the Mudumalai Wild Life Sanctuary of Madras State, a small but attractive place of about 23 square miles. Here is an opportunity for inter-State co-operation either in joint management of a large national park, or in the effective co-ordination of all matters affecting the two parks. It would be a very good thing if the Mudumalai Wild Life Park could be enlarged.

(4) Travancore-Cochin. In this State the Periyar Wild Life Sanctuary is reported to be proposed as a national park. This artificial lake with its numerous creeks and surrounding hills is a beautiful area of 260 square miles, and holds a considerable number of elephant, gaur, sambar and other wild life. A hotel is being constructed, and motor launches are available for visitors to see the sanctuary. The place is under a Game Warden, who is in turn under the Forest Department.

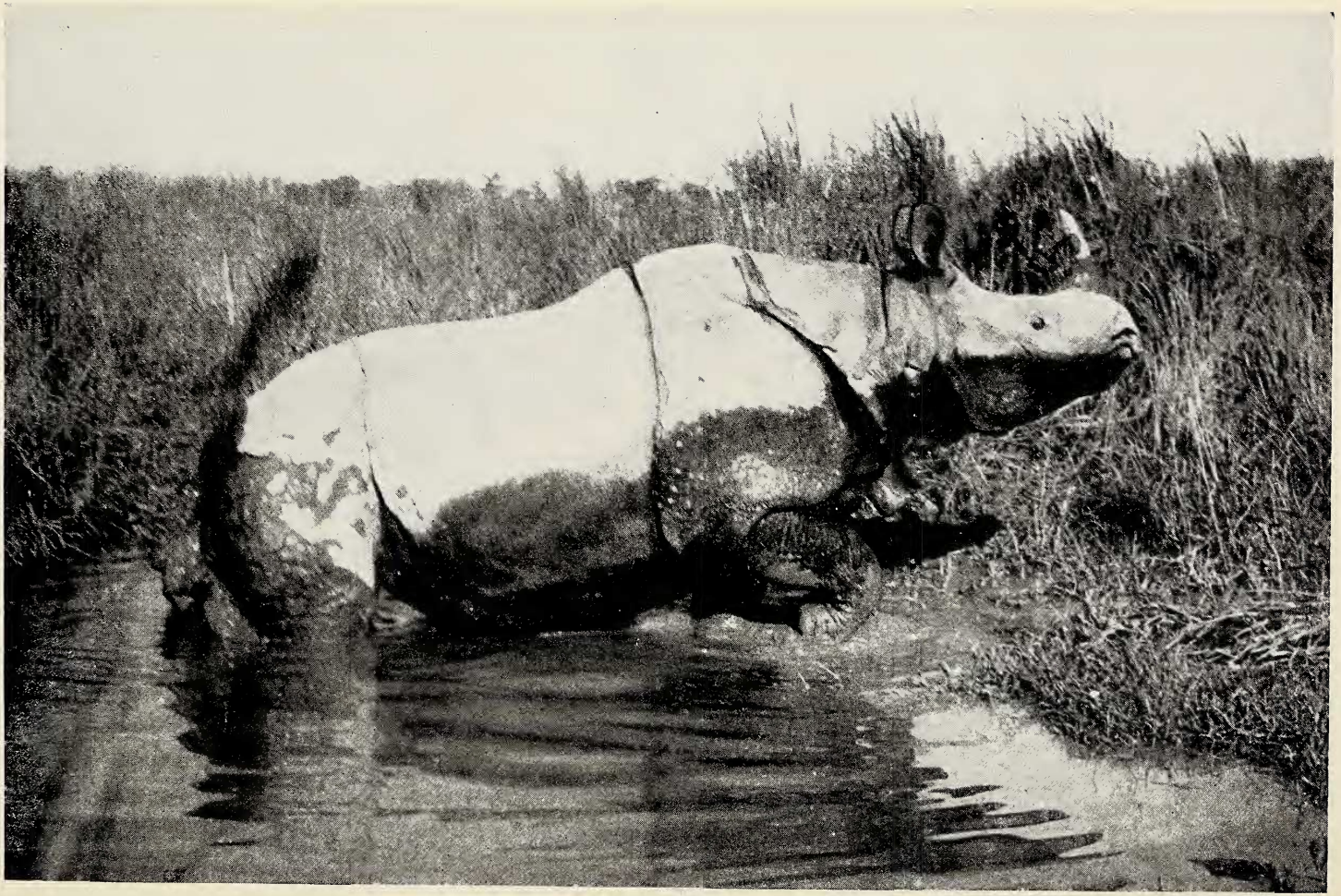
Here again the existence of a Wild Life Advisory Committee is essential for the successful management of the sanctuary. The water resources of the Periyar Lake are leased by the Madras Government, who maintain the dam and other buildings there; but this 'dual control' does not appear to impair the value of the sanctuary as a possible national park—rather the opposite, as a number of visitors come from Madras State to see the wild life so close to their borders.

In accordance with the conditions of the agreement between the Governments of Travancore and Madras, there is no exploitation of forest produce, except a few minor items such as honey, cardamom, etc., within the catchment area of the Periyar river, which forms the sanctuary. A few hill tribes of aborigines used to live inside the sanctuary, but these have been removed and given a colony on the outskirts.

(5) Assam. The State of Assam possesses, on paper, the 800 square mile Tirap Frontier Tract National Park. This is a remote and inaccessible mountainous frontier region, but boasts of primeval scenic grandeur. It is mostly unexplored, and offers rich possibilities to enterprising naturalists, botanists and others. In fact its development as a national park could with advantage be delayed until further

E. P. Gee

A herd of Gaur. Periyar Wild Life Sanctuary, Travancore.



E. P. Gee

Great Indian Rhino. Kaziranga Wild Life Sanctuary

surveys of the area have been made. It is part of the Centrally administrated North-East Frontier Agency, and its bordering on China and Burma will present several difficult problems if it is opened up as a national park. It was 'created' by a Gazette Notification and not by any Act of a legislature.

Assam possesses two very fine wild life sanctuaries which are proposed as national parks. One is the far-renowned Kaziranga Wild Life Sanctuary of 166 square miles, main stronghold of the Indian one-horned rhinoceros, and home of elephant, buffalo, swamp and hog deer and other mammals, and countless birds of many species. Considerable progress has recently been made in providing amenities for visitors, such as accommodation, riding elephants, footpaths and the like.

The other proposed national park is the North Kamrup (Manas) Wild Life Sanctuary of 105 square miles, situated near the Bhutan Hills. Here may exist slightly fewer wild animals and birds than at Kaziranga; but the river and mountain scenery is very pleasing indeed, and all the attributes of a first-class national park are at hand. These Bhutan Hills, in addition to providing the attraction of grand scenery, contain the area to which seasonal migrations of many species of animals take place from the sanctuary in Assam, and for this reason their inclusion in the proposed national park is all the more necessary. In fact if the Government of Bhutan would be willing to contribute a strip of mountainous and thickly forested territory adjoining the northern boundary, then a larger national park, jointly controlled by Assam and Bhutan, could be established which for a combination of fauna and fine scenery would perhaps be unrivalled in the world.

In Assam a Wild Life Advisory Committee has actually been formed, and is now in the process of becoming officially constituted and of having its functions and policies formulated. It will probably consist of some 20 or 30 members, in order to include officials of all the Government Departments concerned, as well as knowledgeable and influential representatives of the public. A smaller Executive Committee is proposed which would shoulder most of the work; and a strong representative sub-committee will probably be set up for each sanctuary. It is reported that an 'Assam National Parks Act' is now being drafted.

(6) Kashmir. It should be possible to create in this beautiful State, and perhaps also in the State of Sikkim and other States bordering on the Himalayas, at least two or three scenic national parks of the type found in the U.S.A. and Central (Alpine) Europe. Such parks would contain the flora and associated fauna peculiar to these particular parts of the world at varying altitudes, as envisaged by H. G. Champion, who also advocates a sanctuary or national park at a suitable place in the western semi-desert zone.

A National Park Policy for India

The next year or two will see the foundation of a national park system in India, in which the management of national parks may be entirely in the hands of the Forest Department—advised, if not

controlled, by Wild Life Advisory Committees consisting of both official and non-official members. It is essential, therefore, that the system should be founded on a sound basis, in which the interests of fauna and scenery, as far as is consistent with the interests of India as a whole, can be safeguarded for all time.

Geological, historical, pre-historical, archaeological and other such national parks are not within the scope of this memorandum, which deals primarily with faunal and scenic areas, priority being given to those places which combine faunal with scenic interests. Those wild life sanctuaries of India which have been tried out and proved to be of success should be made into national parks as soon as possible, in order to ensure that their status is legally secured for all time before it is too late. In the management of sanctuaries and national parks, most activities fall under the headings of either exploitation or interference with nature.

(1) Exploitation. It is advisable at the outset to define the word 'exploitation'. Exploitation can be used either in the bad sense of 'revenue-hunting' and 'squeezing' everything possible out of a forest into the exchequer of the State; or it can be used in the better sense of sound forest management as laid down by the principles of good sylviculture. The first-mentioned type of exploitation by 'revenue-hunting' should in all cases be rigidly avoided: such a practice would hardly ever be justified at all in any wild life sanctuary or national park.

The problem with which we are concerned in India is whether the forests of a sanctuary or national park may be 'improved' by forest management, with limited selective felling and the like, or whether they should be strictly left alone according to the principle of 'unspoilt nature'. Some forests, it might be argued, at the lower altitudes of a hot and humid part of the country are liable to become entangled with weeds and creepers and crowded with dead and decaying trees. At the higher altitudes, especially in South India, the forests are more open and more closely resemble those of temperate climes.

It can also quite reasonably be argued that if forest operations were confined to improving the forest by the making of fire-lines, the burning of dangerous grassy areas, the cutting of creepers, the removal of decaying trees and possibly the felling of a restricted number of over-mature trees, then in many cases a sanctuary or park thus managed might be preferable to one left severely alone to be at the mercy of poachers. Primeval nature where beautiful and beneficial to fauna and flora is a grand thing; but there may be occasions where wild nature can be more beautiful and beneficial in theory than in fact, especially in a tropical country.

But as a general concept sanctuaries and national parks should be left entirely unexploited and undisturbed, presuming that by this the fauna and flora will benefit. And it must be admitted at the outset that the comparatively small size of such places in India, which do not usually exceed a hundred or two hundred square miles in extent, is strongly in favour of their being left entirely unworked by the Forest Department. In many cases the forest operations could be done elsewhere in neighbouring forests. The 23 square mile Mudumalai Wild Life Sanctuary in Madras State, where exploitation of timber is still

being done, is a case of a beautiful though small potential national park which should be exempt from exploitation, and if possible enlarged.

The arguments against exploitation of forest produce by the Forest Department in sanctuaries and national parks are (*a*) that the strict international concept of sanctity is violated, (*b*) that the value of the original flora and fauna in their original state is lost to biologists, (*c*) that the wild life is disturbed and (*d*) that poaching is done by contractors and their labourers.

It has often been found in India, however, that if a portion of forest is sealed off by the Forest Department as a sanctuary and left entirely 'undisturbed', it soon becomes a paradise for poachers who, in the absence of a strong and costly protection staff, can carry on their profitable destructive illegalities with complete impunity.

It can be argued that the conditions peculiar to India may not, as in the case of Uttar Pradesh, permit of an inflexible adherence to the idealistic definitions of faunal national parks in the U.S.A. and Africa as large areas to be kept entirely undisturbed by man, under the control of a separate Wild Life Department. Some of India's sanctuaries and national parks contain valuable timber forests as are not normally found in America and Africa, and their revenues would be indispensable to the States in which they are situated.

If the extraction of this timber were to be done by selective felling under rigid control and under a carefully prepared Working Plan, with suitable permanent preservation plots here and there where wild animals could retreat into perfect seclusion if they so desired, and with due regard to the scenery of the area, it is theoretically feasible that such a policy might not be detrimental to the wild life.

The actual disturbance to wild life in such places is not as great as imagined: the entry of human beings into forests for firewood and timber is a recognised part of the ecological situation of most forests. R. W. Burton has described how he has met tiger, panther and bear in blocks where contractors were working, and how a tigress walked through the ashes of his camp fire. F. W. Champion has also stated that deer would browse at night on the foliage of freshly felled trees, and how tiger roamed at night the roads which were full of human activity by day.

On the other hand, there is little doubt that such human activity in the forest tends to make the animals much more nocturnal in habit, and therefore less in evidence to visitors who would naturally want to see them in daylight.

It would be necessary, of course, to demarcate carefully all areas to be strictly and totally preserved in a national park and to specify them in the relevant Act, in order to eliminate the danger from subsequent changes in Forest Department policy. It would also be necessary to include in the Act rigid rules against the carrying of firearms, traps, poisons, etc., within the boundaries of a national park by anyone except a park official duly authorised by the park authorities.

It is well known that trees which have no commercial value are often the ones which add most to the beauty of a landscape, and can offer satisfactory cover to wild life. If, therefore, the Forest Depart-

ment extract the commercially valuable produce of a forest there is theoretically no reason why the wild life should necessarily suffer, provided that all the precautions listed above are properly taken. It has been found in practice, however, that it is extremely difficult to take such precautions.

In any case such a policy of controlled and restricted exploitation throughout a national park would detract greatly from its intrinsic value as a national park, especially from the scientific point of view. There can be little doubt that in such cases a preferable plan would be either to eliminate exploitation altogether in the park; or else—if the revenue has in previous years been realized and is vital to the State—to divide the park and thus maintain sanctity in at least one portion, with the exploited portion remaining as a buffer or intermediate zone of reserved forest closed to all shooting, with the wild life control in the hands of the park authorities.

It is evident that each case must be carefully studied on its own merits by the Advisory Committee, and decided accordingly. In the case of any exploitation of forest produce already in practice in a sanctuary of India, it would be only reasonable to expect that at least a part of the revenue thus realized should be made available for the development and protection of the sanctuary.

A limited extraction of timber, thatch and such forest produce would, of course, be permissible for meeting the actual needs of the sanctuary or national park, should the occasion arise. This would be a matter for the Advisory Committee or park authority to decide.

Another form of exploitation in sanctuaries in India is the issuing of permits to graziers for grazing of domestic cattle. It is generally agreed that such intrusion by domestic cattle is most undesirable. Not only is it most detrimental to the grazing potential of the sanctuary, but also it is a means by which disease is spread with devastating effect on wild animals. It should, therefore, be avoided wherever humanly possible; and in any case compulsory prophylactic inoculations should be done among the cattle in the vicinity of a sanctuary or park. It should also be made compulsory for all owners of cattle living in the locality of a park to report any outbreak of cattle disease immediately to the appropriate authority.

A minor form of exploitation is the capture and sale of wild animals to the zoos of the world. A few rhinoceroses, for example, are caught occasionally in the Kaziranga Wild Life Sanctuary of Assam. If the rhino population allows of this slight depletion of their numbers, then the revenue brought in for wild life preservation, and the interest created throughout the world in India's rhino, might more than outweigh any considerations of sanctuary violation.

Fishing is another kind of exploitation. Fishing for sport with rod and line is permitted by most national parks of the world in their rivers and streams. Certain portions of rivers could be reserved for research purposes and as spawning grounds.

(2) Interference with Nature. In addition to the utilization of sanctuary resources for revenue, another form of violation of the strict concept of 'undisturbed nature' is intervention, or interference with nature. This may often be expedient, or even necessary.

One of these acts of interference with nature is the deliberate burning off of grass and reeds in order to improve the grazing for ungulates and visibility for visitors. This is very often advisable and any temporary disturbance to wild life is probably offset by the resultant advantage of the growth of young shoots of grass, which are extremely palatable to hoofed animals. Rhino, buffalo and deer in the Kaziranga Wild Life Sanctuary are to be found in burnt off patches almost immediately after the burning, and seem to find even the ashes of some edible value. It is reported that the cessation of burning in the Jaldapara Game Sanctuary of Bengal has resulted in an overabundance of undesirable trees, such as *khair*, *sidha*, *simul*, and others, out of place in such a sanctuary.

The time for burning should be carefully chosen: it is possible that in some cases early or 'cold' burning might cause less destruction to the young of wild creatures, especially of birds, and might also reduce the risk of forest fires in districts where these are a danger. If large areas are to be burnt off, this should be done as 'patchily' as possible. The preparation and early burning of firelines, of course, are essential in forests where forest fires at a later period of the year can be so destructive.

A point to be carefully borne in mind is that where some form of human activity, such as the burning off of grass every year over a period of years, has brought about an ecological situation, the removal of that interference would be liable to cause a change in the general situation which might upset the ecological equilibrium of the place, with possible adverse effects on the wild life.

In most parts of India the reserved forests contain 'Forest villages' (as in Assam), or 'Settlements' of aborigines and 'Revenue Enclosures' (as in South India). These usually provide free labour to the Forest Department in return for the land they occupy; and while the advantages of this scheme for forestry work are obvious, the disadvantages are equally apparent in those particular places where fauna is of importance. It is reported that in the Chamarajanagar Wild Life Sanctuary of Mysore, for example, the presence of settlers in possession of guns in the sanctuary has resulted in the depletion of the deer. Only in very rare cases could their existence be justified in a wild life sanctuary or national park.

Another act of interference with nature is the provision of artificial salt-licks. This has been found beneficial to wild life in many countries: for instance in the Nairobi National Park of Kenya natural salt-licks have been augmented and others have been created.

The damming of streams and sinking of wells to ensure a supply of water for wild life in the dry season is also often advisable. In the Kruger National Park, for example, fifty successful boreholes and wells have been established with windmills; and in some places drinking points were crowded with animals within fourteen days of the commencement of pumping. Dams with flat pan-like surfaces have been sited in open country with good clear approaches. The local ecology of the wild life thus becomes changed—to the advantage of the wild life, as straying from the park in search of water is eliminated.

With regard to the damming of large rivers for hydro-electric and irrigation schemes, this may be deemed unavoidable in the over-

riding interests of the State. Although there would be considerable disturbance, though not necessarily destruction, of wild life during the construction of the dam and other works, the ultimate result need not be disadvantageous to the wild life or detracting from the scenery—as has been proved in the case of the Periyar Wild Life Sanctuary of Travancore. Moreover the acquisition of the roads, buildings and the like would be an asset to the park. If the water of the Manas river in the North Kamrup Wild Life Sanctuary of Assam were ever to be impounded, the resultant lake in the Bhutan Hills could be made to fit into the general scheme of a park with satisfying results—both scenic and faunal.

It may also be necessary to interfere in the natural course of events in the domestic affairs of wild life. For should any particular animal or bird in a sanctuary multiply to undesirable numbers, its increase might have to be checked in the interest of the wild life as a whole. Where the 'balance of nature' has been upset by man, it can be justifiably corrected by man. In the Periyar Wild Life Sanctuary of Travancore, the number of sambar has declined due to the increase of wild dogs. These pests must be ruthlessly destroyed. Crocodiles in some places need to be kept under control. This form of control has been found necessary in other countries: for example in the Nairobi National Park 300 hyaenas recently had to be destroyed.

In the Kruger National Park, the numbers of lion, leopard, hyaena, cheetah and wild dog are kept within limits in order to foster the increase of hoofed animals. In the national parks of the U.S.A. the elk, mule deer, buffalo and others frequently have to be reduced in numbers consistent with the amount of grazing available.

The same would apply to the flora of India—excessive encroachments by water hyacinth, eupatorum, lantana, and suchlike destructive plants must be prevented if possible.

Conversely it may become desirable to introduce certain animals and birds into a sanctuary or national park. It is strongly recommended that in no case should a 'foreign' species be introduced into India's wild life sanctuaries. The introduction some years ago of zebra into the Periyar Wild Life Sanctuary was a mistake—fortunately none of them survives today. There could be no objection, however, to the re-introduction of species which formerly existed in an area. For example Indian cheetah, Indian wild ass, Indian lion, brow-antlered deer and others could most advantageously be re-introduced where they have now become extinct.

Afforestation is an act of interference with nature which may be advisable in some places to remedy the much greater interference by man in the past, which resulted in the disappearance of the forests. The introduction of exotic species, unless their long-term effects are known to be definitely beneficial to wild life, should be avoided.

Lastly there is a form of interference with nature which is usually necessary in national parks and wild life sanctuaries—that of providing the means by which the place can be made accessible and attractive to the public. It is essential that access roads be constructed where non-existent, and that accommodation and suchlike amenities